Battlefield Decontamination Using Aircraft

By Captain David Bergman

The Australian Defence Force (ADF) has never had the luxury of a dedicated Chemical Corps or the decontamination battalions that are available to our allies in the United States and Britain and our nonallies such as the former Soviet Union. The ability of the ADF to decontaminate in a chemical, biological, radiological, and nuclear (CBRN) warlike environment at the tactical level is based on limited equipment and personnel at the brigade level. The decontamination capability currently consists of combat engineer regiments and a troop from the Emergency Response Squadron, Incident Response Regiment. Because decontamination is only one of a range of tasks for each, the priority for training, experience, and preparation for brigade decontamination tasks is at a low level. The employment of decontamination assets is based on post-World War II developments.

Ways to increase the effectiveness of the limited resources that we have at the brigade level for decontaminating large numbers of vehicles and personnel in a tactical warlike environment needs to be looked at from as many different perspectives as possible. In this time of change, we need to look to battle cunning[1] to provide an edge in a difficult task and look laterally to apply techniques used by other organizations.

This article explores the "outside-the-box" concept of using aircraft on the battlefield to assist engineers in mass chemical and biological decontamination of vehicles, personnel, and ground. It also suggests the possibility of sharing this resource with other Australian national stakeholders.

Outside the Box

When you think outside the box,
The problem's always greater.
The reality is often such
That the others just don't get it.

It's often hard to visualize
And harder to explain,
But what's as plain as your nose
Can be someone else's game.[2]

Background

"Land warfare represents the most comprehensive form of conflict and, until recently, victory or defeat on land has been synonymous with victory or defeat for the state."[3] With the increase in world tension in respect to the proliferation of chemical and biological weapons, the ADF needs to be able to better support units on the battlefield. Currently, engineers provide this support in the form of mobility/survivability at the tactical level of operations, which includes decontamination.

"Decontamination is a progressive operation that removes residue contamination from personnel and material with the aim of restoring combat power by allowing a reduction in protection levels."[4] Decontamination is traditionally a labor-intensive task. The Soviet Union, prior to its loss in the Cold War, employed thousands of troops dedicated to decontaminating its forces en masse on the battlefield. As a small force, the ADF needs to have a knowledge edge over potential adversaries.[5] For example, to decontaminate a brigade on the battlefield, we may be able to look to technology to overcome labor and other resource requirements.

Technological Advances

There have been advances both in aircraft and in additives to water to increase the fire retardant effectiveness of water. One advance in technology that has a relevance to decontamination on the battlefield is firebombing aircraft.

Foam

Foam is used as an additive to water for firebombing tasks. An example of this is the Bombardier CL-415 amphibious aircraft where the foam chemical is carried in one or two 300-litre (80-gallon) reservoirs. "*When used, it is injected into the water load at a ratio of 0.3 percent to 0.6 percent by volume. Using a 0.4 percent concentration, which is typically used in fire fighting, a 6,000-litre (1,585-gallon) water load requires only 24 litres (6.4 gallons) of foam concentrate.*"[6] "*Class 'A' fire fighting foam, as it is more commonly known, is*

designed to be mixed with water to produce a very effective fire suppressant. Foam has the following characteristics:

- *It improves the drop pattern.*
- *The mixture of foam and water expands and doubles the drop area.*
- *It protects unburned vegetation and structures.*
- *It increases moisture penetration, creates an air barrier, and reflects radiant heat.*
- *It also clings to tree and structure surfaces providing additional protection.*
- *The foam drop can easily be seen from the air, enabling pilots to maximize coverage.*"[7]

The characteristics outlined above appear similar to those desired in the use of Canadian Aqueous System for Chemical-Biological Agent Decontamination (CASCAD) or similar decontamination agents. One of the reasons sited for moving to foam over other fire-suppressant additives is that "*foam is inexpensive compared to the cost of dropping an equivalent quantity of long-term retardant (red slush commonly used as a fire barrier).*"[8] The benefits to the ADF are not necessarily the cost but the capability of providing large amounts of decontamination foam over a large number of equipment and it stores quickly and efficiently.

The suitability of the firebombing aircraft to be utilized in battlefield decontamination depends on the performance of decontamination foam when dispensed from aircraft. The crux of the issue is whether decontamination foam has the same or similar properties that allow it to be dispersed from aircraft, just as fire retardant foam is now. Defence Science and Technology Organisation (DSTO) specialist support and trials are required to qualify the suitability of this method of decontamination.

Quick and efficient decontamination of contaminated personnel and equipment on the battlefield is a significant goal. As stated in ADF Publication (ADFP) 15, *"The need for decontamination will significantly affect any operational plan. A commander must decide on the degree of decontamination necessary and the control measures to be adopted. Decontamination will impose delay to operations and may render the force less capable of defeating a follow-up attack."*[9] A method that sees the decontamination process commenced in a comparatively short time is worth exploring.

Fire Fighting and Aircraft

In fighting bushfires, as in most other areas of life, the issue comes down to one of cost. In respect to the ADF, cost does play a part, but it could be argued that it is the capability that takes priority. The Australian Fire Authorities Council found that ground suppression is the most cost-effective means of fire suppression where access is good.

The council also found that "*the operating cost of medium helicopters is higher than fixed-wing aircraft carrying similar loads, but their accuracy and ability to pick up retardant close to the fire can make them more cost effective.*"[10]

The council investigated the option of investing in large aircraft and found that "*the investment required for the operation of large air tankers or water scoopers is not justified.*"[11] This appears to be due to the costs involved. The current line of thinking supports this with a recent report in the news media stating that *"the federal government will spend as much as $5 million—up to half the cost—to bring three helitankers to Australia for the bushfire season."*[12]

Successful aircraft decontamination foam dispersal trials would open up possibilities of asset sharing between the ADF and other state and federal agencies. This would provide a combat capability for the ADF, while providing potential cost savings for other government agencies.

Chemical, Biological, and Radiological Weapons

Indirect fire support weapons capable of delivering chemical, biological, and radiological (CBR) warheads for use in the tactical battlefield environment and their chemical/biological effect on the battlefield is questionable. *"Even missiles with chemical and biological warheads, however, may be more terror weapons than true weapons of mass destruction."*[13] In his book, Cordesman's reason for this is that *"under optimal conditions such as exposed personnel, a flat plane, and optimal delivery conditions, the VX chemical warhead used on a Soviet version of the Scud missile indicates a 50 percent casualty rate for exposed personnel as opposed to a real lethality rate estimated at between 5 and 20 percent."*[14] Given that the use of CBR weapons on the battlefield may not produce as many physical casualties as desired, these weapons have the potential to produce results out of all proportion to their size.

Without effective and efficient decontamination methods, the combat effectiveness of a brigade could be removed for a considerable time. As ADFP 15 outlines, *"Priorities for decontamination must be clearly directed by the commander and initial measures should be limited*

to those necessary to allow operations to continue. The following principles of decontamination should be considered in order of priority:

- ***As soon as possible.*** *The sooner the contamination is removed, the sooner the protective clothing levels can be reduced and combat power restored.*
- ***Only where necessary.*** *To survive and win in a contaminated environment, precious resources and time cannot be wasted. Thus, decontamination should only be carried out where it is necessary to continue the mission.*
- ***As far forward as possible.*** *Contaminated personnel and equipment should not be moved rearward if decontamination assets can be moved forward safely. This allows assets to be where they are needed and decontamination to begin earlier and limits the spread of decontamination to other areas.*
- ***By priority.*** *Items of equipment should be cleaned in their order of importance to the mission.*"[15]

If the methods used by firebombing aircraft to dispense firefighting foam on fires can be applied to dispensing decontamination foam by similar aircraft, then the four principles of decontamination can be enhanced. The end result is that having a quick and efficient method of providng large amounts of decontamination foam to where it is most needed can reduce the effectiveness of CBR weapons.

Trials

Upon concurrence with DSTO on the feasibility of decontamination foam theoretically being able to be delivered effectively from aircraft, there are several ways for trials to be conducted. The first, with the blessing of fire brigades, is to conduct limited trials with medium helicopters hired by the federal government during their time in Australia later this year.

Another option would be to conduct limited trials in Canada. This could take many forms, one of which could be joint trials with the Canadian Defence Force. These trials could make use of the CL-415, which is fitted for foam dispersal.

Using current ADF aircraft and modifying them to dispense foam is a third option. All current ADF aircraft that provide a lift capability could be modified to allow them to undertake decontamination tasks. This includes Black Hawk, Chinook, and Hercules aircraft. The question of providing this capability for fire fighting would need to be addressed in a different forum. However, it is worth noting that by participating in firebombing activities, aircraft crews would be maintaining skills similar to those needed to carry out a decontamination task on the battlefield. If required, during bushfires these assets could be available to state governments as part of the Defence Force Aid to Civilian Authority. This would combine with the ADF chief's philosophy when he was land commander: "*Our skills must be second to none, honed for combat but adapted for peace.*"[16]

Bombardier CL-415 Aircraft

It is worth looking at the CL-415 as a decontamination-dispensing platform because its versatility may add to decontamination tasks it could potentially be used upon. One example would be large oil spills at sea. *The multipurpose CL-415MP [multipurpose] is designed to help governments manage a wide range of state responsibilities with a unique aircraft. The CL-415 was designed from the outset for daily operations in very demanding conditions: very short response times, short take-off and landing distances, high maneuverability, and the ability to operate from land or from the sea.*"[17]

"*Other fixed-wing aircraft simply don't have the structural integrity—especially the corrosion resistance—the configuration, nor the performance to accomplish what the Bombardier [CL-415] is able to do. Helicopters approach the versatility of the CL-415MP but offer less speed, range, and endurance and have substantially higher acquisition and life cycle costs.*"[18]

The benefits of sharing a purpose-built aircraft such as the Bombardier CL-415 is outlined in their information. "*A Ministry of Interior will perform police operations against drug smuggling, infiltrations, and illegal immigration. Civil protection departments will use the aircraft for disaster relief, carrying equipment, supplies, and technicians to short airstrips or to isolated areas. Environment and forestry departments will benefit from its unsurpassed aerial firefighting capabilities but also be able to detect and monitor pollution at sea, contain oil slicks, and gather samples from the water surface for analysis, treatment, and evidence. Agricultural entities will perform pest control on large areas with the recently developed spray system. Fisheries and customs defence agencies will do discrete surveillance and identification of vessels* [and] *their activities but also be able to land and intervene. Coast Guard and*

defence agencies will have the benefits of an aircraft that is also a fast boat, patrolling at 120 knots and 500 feet, and able to deploy Bombardier's Jet Boat to reach ship or shore or to perform direct search and rescue."[19]

Summary

There have been no significant improvements in battlefield decontamination delivery methods over the past fifty years. Battlefield decontamination still relies on vehicles, held in reserve of maneuver units, being brought forward to deliver equipment, water, and personnel to the contaminated unit, with the aim of restoring combat power by using standard techniques. By looking at developments in fire-fighting techniques and, in particular, advances in foam dispensing from aircraft, an opportunity exists to modernize and enhance battlefield combat decontamination delivery methods.

The vision of seeing firebombing aircraft laying decontamination foam over a contaminated mechanized brigade—allowing the decontamination process of vehicles and equipment to be sped up and therefore more quickly continuing the maneuver warfare battle—has many benefits. Not only does it allow combat power to be restored more quickly, but it also reduces the effectiveness of CBR weapons and reduces the use of significant resources such as manpower, time, and equipment.

Endnotes

[1] Land Warfare Doctrine 1: Fundamentals of Land Warfare, (LWD 1), 2002.

Note: Battle cunning is the basis of "bottom-up" innovation in the conduct of tactical land force operations. Battle cunning is the use of initiative to best adapt to, and take advantage of, the prevailing circumstances. It creates surprise and confusion in combat that undermines the enemy's cohesion and effectiveness.

[2] D.A. Bergman, September 2001.

[3] Land Warfare Doctrine 1.

[4] ADFP 15, *Operations in a Nuclear, Biological and Chemical Environment.*

[5] Land Warfare Doctrine 1: *Fundamentals of Land Warfare*, (LWD 1), 2002.

[6] *<http://www.aerospace.bombardier.com/en/3_0/3_3/3_3_9.html>*

[7] Ibid.

[8] Ibid.

[9] ADFP 15.

[10] A. Victoria Hodgson, Department of Conservation Forest and Lands, *Firebombing*, 1987.

[12] Use of aircraft for firebombing in Australia, The Australian Fire Authorities Council, 1996.

[12] *The Sunday Telegraph*, September 15, 2002, p.96.

[13] A. H. Cordesman, *Weapons of Mass Destruction in the Middle East*, 2000, Brassey's UK, p.56.

[14] Ibid., p.58

[15] ADFP 15.

[16] ADFP 15.

[17] *<http://www.aerospace.bombardier.com/en/3_0/3_3/3_3_7_61.html>*.

[18] Ibid.

[19] Ibid.